massDOT
Massachusetts Department of Transportation
Aeronautics Division

Fall 2018
Volume 2, Issue 4

On the Approach

Dr. Jeffrey DeCarlo Massachusetts Department of Transportation (MassDOT) Aeronautics

Inside this issue:

Administrator's Message

Well here we are, well on our way in fiscal year 2019 aviation activities. We are making great strides in several areas, including our state and federally funded airport safety, maintenance and development projects, our new IT business system training and implementation, and the drone program for MassDOT, the MBTA, and the Commonwealth.

Time "FLYS"

Before I get into a discussion of those activities, I have something to report. As I write this article, the calendar reminded me that I have completed three years with MassDOT Aeronautics. The time has absolutely flown by; …yes…, pun intended! I think that the reason that many of us have the perception of the rapid passing of time is that we are all engaged and busy in work that we genuinely enjoy. Our internal and external teams (yes that includes many of you) are extremely active, with lots on our plates, challenging each other to excel in our work, and to improve processes and systems, while also ensuring that we optimize our scarce resources. I believe that many of us tend to share certain traits, including never being satisfied with the status quo, and striving to continually improve the way we do business, and all of this, while smartly and positively addressing new opportunities and challenges. As the saying goes, time "flys" when you are having fun" …and we ARE having fun!

FAA and State Funded Airport Safety, Maintenance and Development Projects

Additional $1B in FAA AIP Funding

The recent announcement of some serious additional money for the FAA AIP Program was welcomed by all of us. The initial funding selection criterion indicated that only a couple of our airports may qualify for a piece of the $1B funding. That news was a bit of a bummer, but we are in regular communication with the FAA, and have identified a whole host of shovel-ready airport projects. We are ready to go with additional shovel-ready projects if additional FAA funding becomes available!

State Airport Administration Building (SAAB) Program

I'm really excited about the work we have planned this year for the State Airport Administration Building (SAAB) program. The Group 2 effort is moving forward in FY 2019, and we hope that funding (and momentum) will continue well into the coming years as we complete Group 2, and beyond.

The Aeronautics Division's mission is to promote aviation throughout the Commonwealth while establishing an efficient integrated airport system that will enhance airport safety, economic development, and environmental stewardship.

Administrator's Message (Continued)

Plymouth Municipal Airport– Pilgrims 2020

The Plymouth Municipal Airport building is important and exciting, as 2020 will mark the 400-year anniversary of the landing of the Pilgrims. The anniversary is a major milestone, with both national and global significance. It's really exciting to know that as the level of activity ramps up in advance of that date, Plymouth Airport visitors will be greeted by a new facility, an airport nerve center that is truly state of the art.

Harriman and West Airport – North Adams

In addition to the Plymouth Airport Administration Building, we're moving forward with an Airport Administration building project at Harriman and West Airport in North Adams. In this case we are renovating a building that was donated to the airport. The building will be transported to the site and fully renovated. It is a major effort, but the donation will save the Commonwealth a significant amount of money.

Norwood Memorial Airport

For Norwood Memorial Airport, an innovative plan will construct an elevated airport administration space within the Snow Removal Equipment (SRE) Building. This project has been planned for some time now, and although it includes some funding from the FAA, the majority of the finding for this project comes from the Commonwealth.

Taunton Municipal Airport

The Taunton Municipal Airport Administration Building is planned as the final building in Group 2. We hope that additional funding will be secured, and that we can get all of the permits and "paperwork" completed so that we can start construction in the near future.

Airport Environmental, Security Camera, and Pavement Programs

Environmental

The Vegetation Management Program (VMP), including the very visible Yearly Operating Plans (YOPs) and the related construction work have been executed beautifully over the past several years. MassDOT has also made a thoughtful investment in equipment to ensure that that the vegetation levels are properly maintained by the airport management team going forward.

Airport Security Cameras

Airport security has never been more important. To that end, our airport security camera program is continuing in earnest. We have had great results, and our partnership with the MBTA security team as well as our airports and municipalities has really worked extremely well.

Pavement

In the first yearly update of pavement condition since the independent pavement assessment last year, our pavement condition indexes (PCI) have remained flat. The analysis of the data indicates that pavement investment is at a level that only allows us to maintain the current PCI levels. We believe that we must continue to increase investment, and if we do so, the pavement condition across all of our airports will definitely improve. In addition, if we invest more now, we will most assuredly save money later.

Let me be clear, our airport pavement is certainly safe. However, the current level of investment will actually result in a higher cost in the future. It is a really simple and low risk problem. If we invest more over the next several

Administrator's Message (Continued)

years, our PCI numbers will improve. In addition, the investment will ensure fewer major reconstruction projects, which are costly and unnecessary if the pavement investment is adequate to accomplish the appropriate maintenance.

We understand that resources are limited, but our team will continue to make the business case for additional airport pavement investment. In the meantime, we are working hard to smartly prioritize our current level of pavement investments to ensure that we get the best bang for the buck.

Drone Program

Speaking about pavement, our drone program may be able to assist with our pavement assessment and maintenance efforts. Our internal engineering department is actively working with the drone program team, UMass Lowell and UMass Dartmouth to accomplish applied research into the use of drones to assist us with our state of good repair efforts for pavement. Operationally, we are actively testing drones in an attempt to find out the best combination of fixed wing and rotary wing platforms, sensors, as well as the software, analytical programs and best practices to leverage this new technology.

The drone program is gaining more and more momentum, and has achieved a lot of success. Although quite a new effort, we are now utilizing drones across the Aeronautics, Highway, and Rail and Transit Divisions, as well as the MBTA. We will be ramping up our bridge and rail inspection programs, while we continue to leverage our drone capabilities for construction site monitoring, aircraft accident investigation and incident response activities.

In addition to our internal MassDOT and MBTA drone activities, we are providing assistance to other commonwealth agencies. As the Commonwealth lead for drones, our mission includes sharing best practices and leveraging the capabilities of this new technology. Without a doubt, drones can improve safety, reduce task time, improve the

Photo : Drone photo of Commonwealth Ave Bridge Project

Administrator's Message (Continued)

quality of data, and reduce costs. In addition, we believe that unmanned and autonomous systems will be a huge economic driver for the Commonwealth's economy.

Much Appreciation

I want to personally thank the entire Aeronautics Division (AD) team for their continued hard work on the Aurigo Masterworks project management software effort. Over the last 18+ months, each and every member of the AD has had to go above-and-beyond to get us to the exciting point of training and implementation. The AD team has truly bent over backwards to accomplish both their day-to-day work, as well as providing the business input and validation for the new software. This project management and capital improvement program system will provide superior utility, and allow us to carefully track our business and improve our performance. By the way, I would be remiss if I failed to mention the important oversight and engagement by the steering committee for this project. The committee includes a cross-competency team from our MassDOT IT organization, as well as volunteers from airport management, airport engineering, as well as former Aeronautics Administrators. ✈

Photo : Drone photo of Commonwealth Ave Bridge Project

MassDOT Aeronautics Vegetation Management Program – Equipment Spotlight: Ventrac 4500

By: Nate Rawding (Environmental Analyst III- MassDOT Aeronautics Division)

For success in any job – you need to have the right tools. This is especially true for any successful vegetation management program. In an airport environment, the right maintenance equipment helps protect airspace from regrowth of vegetation previously cut, prevents hazardous wildlife attractants, and maintains accessibility around the airfield. Further, having the right equipment allows an airport to save time and to maintain investments in vegetation management work made previously by FAA and MassDOT.

While large tractors – such as John Deere – are often used at airports for maintaining the large areas of grass, additional equipment is also needed to go beyond these grass areas. As part of the Fiscal Year (FY) 2018 funding cycle, MassDOT assisted two airports (Turners Falls Municipal and Lawrence Municipal Airports) with equipment purchases.

Photo : Demonstration of Ventrac Equipment by MTE Turf Equipment Solutions at Turners Falls Municipal Airport, Spring 2018.

Both airports are challenged with areas of steep and uneven terrain that makes mowing difficult or impossible with their standard tractors and trail-behind cutting decks. The solution for the airports was found in the Ventrac 4500. Both airports moved forward with the Ventrac, after the Northeast distributor, MTE Turf Equipment Solutions, demonstrated the equipment at Turners Falls in the spring. A key advantage that the Ventrac has over similar equipment is the ability to operate on slopes up to 30 degrees with a rough cutting deck that can handle woody regrowth (1-2 years old) of vegetation. Additionally, the tractor can articulate and oscillate – meaning it can handle

Photo : The Ventrac 4500 mowing a 30 degree (58% grade) slope at Lawrence Municipal Airport

MassDOT Aeronautics Vegetation Management Program – Equipment Spotlight: Ventrac 4500 (Continued)

By: Nate Rawding (Environmental Analyst III- MassDOT Aeronautics Division)

the uneven terrain that hampers most other equipment.

Another feature making the Ventrac tractor appealing to airports is the ability to run a variety of attachments; from snow removal (blowers, sweepers, spreaders) to buckets, stump grinders, and more. The multi-use nature makes the equipment available year-round to assist the airport in various maintenance needs. The attachments are easily engaged by riding up to the attachment and securing them.

With these new tractors, each airport now has the capability to maintain vegetation in areas that were previously inaccessible or challenging to maintain. This ultimately leads to lower long-term costs for the airports when it comes to vegetation management.

Most recently, the staff at MTE Turf Equipment Solutions trained Lawrence Municipal Airport maintenance staff this July on the operational and maintenance needs of the equipment. The Ventrac has already been put to use, and is saving the airport time over past methods. One area that may have taken the airport staff upward of a week to maintain, is now completed in a couple of hours; freeing up the airport staff to attend to other maintenance needs at the airport.

In addition to this equipment, MassDOT Aeronautics Division is looking to fund sustainable and alternative fueled equipment (e.g., bi-fuel/propane, Li-on battery powered) for vegetation maintenance at Massachusetts public-use airports. Equipment that is alternative fuel or battery powered has the added benefit of being "green" which offers both fuel savings and cleaner burning emissions that can reduce your carbon footprint. Questions about the MassDOT Aeronautics Statewide VMP program, vegetation challenges, or equipment needs, can be directed to Environmental Analysts Nate Rawding at 617-412-3636 or Mike Garrity at 617-412-3690. ✈

Photo : Airport Working Foreman Domingo J Corona and Airport Maintenance staff Rafael Pepin, at Lawrence Municipal Airport. Note the large smiles!

Plymouth Municipal Airport Celebrates Groundbreaking of new Airport Administration Building

By: Denise Garcia (Director of Aviation Planning- MassDOT Aeronautics Division)

On June 14th, Plymouth Municipal Airport celebrated the groundbreaking of a new 5,500 square foot administration building benefiting from $4.8 million in state and $254,000 in local funding.

The new administration building will be approximately one-third larger than the existing building and is expected to be completed in spring 2019 – ahead of the Town of Plymouth's 400th anniversary in 2020.

The building will be erected in the traffic circle in front of the existing administration building. The current building will remain open for business during construction and will then be demolished and converted into outdoor restaurant seating and additional apron space.

According to the MassDOT Statewide Airport Economic Impact Study, completed in 2015, Plymouth Municipal Airport supported 319 jobs with a payroll of nearly $13.7 million and generated over $47.8 million in economic output. The airport also supports approximately 60,000 aircraft take-offs and landings each year.

"This new building will offer many new features including more space for office and administrative personnel, as well as room for a restaurant and businesses, and conference rooms that can be used by members of the public," said Transportation Secretary and CEO Stephanie Pollack.

"This new structure will be important not just for what it is, but for what it does – allows the airport to continuing serving people throughout the region and providing options for travelers," said MassDOT Aeronautics Administrator Jeffrey DeCarlo.

"Under the leadership of Governor Baker and Lieutenant Governor Polito we are continuing to support the growth of municipal and regional airports throughout Massachusetts, and we thank the many people who have been involved in this project and have helped get us to where we are today."

The Aeronautics Division is pleased to see that construction is now underway and we look forward to seeing the finished structure that will benefit the Plymouth Municipal Airport for many years to come.✈

Photo : Groundbreaking of New Administration Building

Using Green Technologies for Apron Reconstruction

By: Thomas F. Mahoney, PE (Director of Airport Engineering - MassDOT Aeronautics Division)

MassDOT has initiated a pilot program using green technologies on airfield pavements. The project goal was to utilize Warm Mix Asphalt (WMA) and permeable asphalt pavement as part of the reconstruction of an aircraft parking apron at Southbridge Municipal Airport.

In 2017, the main apron at Southbridge had a Pavement Condition Index (PCI) of 45 but that is only a part of the story. In 2016, MassDOT provided an emergency grant to replace several concrete tie downs that had 'heaved' and were a safety hazard. In the spring of 2018, it was decided to reconstruct the entire apron and provide the airport with a grant for approximately $1.5 million. The design and construction was to be spread over two fiscal years to minimize impacts on the budget.

In accordance with the FAA Advisory Circular (AC) 150/5100-13B – Development of State Standards for Nonprimary Airports, state highway specifications for pavement construction can be used. One of the options available to the airport was the use of Warm Mix Asphalt (WMA) versus the standard Hot Mix Asphalt (HMA). MassDOT Highway Specifications for Warm Mix were used. WMA differs from HMA in that the production temperatures can be lowered by anywhere from 30 degrees to 120 degrees which means it takes less energy to produce. Once the mix gets to the job site, less emissions and odors are released at lower production temperature. This creates a worksite that is cooler for workers during placement and compaction.

During the design of the apron, it was discovered that the FAA design criteria changed for the layout of 'tie-down' and with the new layout, the airport would lose a large amount of valuable parking spaces. It was suggested that the apron be expanded to gain most of the position back. For that expansion, MassDOT suggested the use of permeable pavement. This expansion was bid as an alternate including the permeable pavement. The cost of the entire project came within acceptable limits and the alternate was accepted for construction. Again, MassDOT Highway Specifications for Permeable Pavement were used for this project.

Permeable pavements provide both environmental and operation benefits. Environmentally, this pavement reduces stormwater runoff, increases groundwater recharge and improves water quality. Operationally, the surface does not freeze in the winter so that the area doesn't need to be de-iced. In an effort to maintain its porosity, the apron should be vacuumed on an annual basis. Also, after rain events, the apron should be inspected to ensure that the permeable pavement is functioning as intended. ✈

MassDOT Aeronautics Drone Program Team Supporting Highway

By: Faine Greenwood (MassDOT Drone Team)

If you've driven over Commonwealth Avenue in recent months, you might have spotted a drone hovering over the construction area. These drones belong to the Aeronautics Division's Drone Program. Since March 2017, the program has been exploring how drones might make MassDOT and MBTA operations safer, more efficient, and more cost-effective. With a particular emphasis on safety and data security, the Drone Program intends to set the standard for state-level drone programs, providing cutting-edge technological capacity and informative data products to MassDOT personnel. At the start of the Drone Program, project leaders reached out to operational leaders within the Highway Division, seeking to better understand Highway's missions and how drones might help. With the support of MassDOT Secretary Stephanie Pollack, the Drone Program soon began testing the operational deployment of drones across many different MassDOT use cases.

MassDOT Aeronautics Drone Program Team Supporting Highway (Continued)

By: Faine Greenwood (MassDOT Drone Team)

As of the summer of 2018, the Drone Program has flown over 60 times in the Commonwealth, in all six highway districts. The program's very first flights, in September 2017, collected data that was used to support the building of District 3's new headquarters in Worcester. The Drone Program has flown repeated missions on a monthly basis ever since - proving that these aircraft are reliable enough to carry out regular missions. In addition to these flights, the Drone Program has crossed the state with its "roadshow," engaging all six highway districts in conversations about what the program is doing and how it can better assist them in their work. The Drone Program is also working closely with several highway Resident Engineers who have experience with drones, in order to better understand their highway perspective to the program, and to ensure that drone missions are truly aligned with Highway needs. The Drone Program currently owns over a dozen airframes, running the operational gamut from long endurance, high speed fixed wing aircraft, to multirotor models that carry high-resolution imaging equipment.

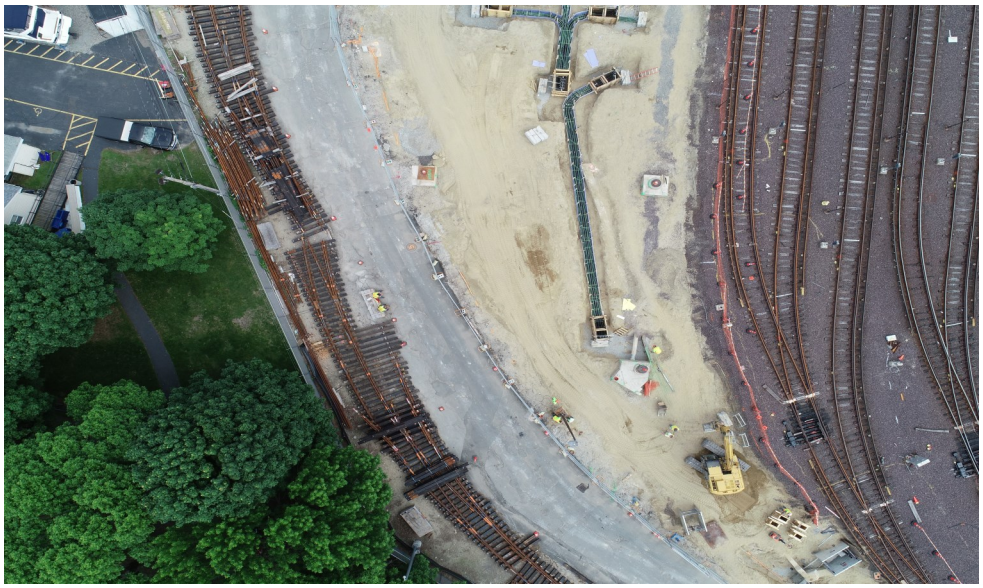

Photo : Drone photo of Wellington Station

Furthermore, the drone program has closely supported the Commonwealth Avenue Bridge Replacement project, and tracked its progress from a unique vantage point. In addition to the Commonwealth Avenue project, the drone program has been working to make drones readily available to the Highway Operations Center (HOC) 24-hour rapid response command center. Drones will be able to provide the HOC with real-time video and imagery of accidents and incidents, allowing them to enhance their situational awareness of incidents throughout the Commonwealth.

The Drone Program has had a very successful first year, and it is growing: With drone flights supporting MassDOT operations nearly every day, drones will soon become a more common - and welcome - sight over MassDOT projects. A huge thank you to Jeff DeCarlo, Aeronautics Administrator, and his team; Amy Fagerlund, Scott Uebelhart, Terrence McKenna, Paige Scott-Reed, Andrew Mihaley and Tracy Klay for their hard work and efforts on the Drone Program. Additional time lapse photographs can be seen here: https://app.oxblue.com/open/BU/bridgedeck ✈

Intern's Perspective– Sungchul Takahashi

By: Sungchul Takahashi (Civil Engineering student– Umass Lowell)

My name is Sungchul Takahashi and I am a Civil Engineering Student at the University of Massachusetts Lowell. After my Summer Internship at MassDOT, I will be entering my senior year in the fall.

Over the summer I have been lucky enough to work at the MassDOT Aeronautics Department as a part of the Drone Pilot Program (DPP). A really amazing project that I am leading is the analysis and validation of drones for survey applications. The main objective of my project is to determine the accuracy of 2D and 3D calculations measured by small Unmanned Aerial Systems (sUAS), with hopes of integrating drones in future survey work. We will be working alongside a survey team in order to compare and validate the drone data with survey data that has been collected through traditional methods. At the same time, we will be testing different methods of drone surveying which include rotorcraft, fixed wing, Ground CentrePoints (GCPs), Aeropoints, and various sensors. Traditional methods of surveying cost a lot of money and they can take a really long time as well. It usually takes a survey team a whole day to go out to a site and survey the whole area. For a drone to survey the same area, it could take as little as a half an hour. The only problem is that a drone may not be able to get the required accuracy for surveying. That is why I am researching different methods and factors that can increase the accuracy of our drone survey data. ✈

Intern's Perspective– Ethan Sit

By: Ethan Sit (Aerospace Engineering student– MIT)

It's a Friday morning four thousand feet in the sky, in what is arguably the most luxurious flight accommodations one could ever ask for.

Three feet of leg room? Check.

Unrestricted free Wi-Fi? Got that.

Working air conditioning? Yep.

A 270 degree view of the sky and iconic Massachusetts landmarks? Absolutely.

I was in the copilot's seat of a four seater Piper Arrow controlled by one of MassDOT's very own pilots. Three months ago, when I signed up for a government internship, I never expected anything like this. Most freshmen at my tech-centric university aspire to join hordes of interns at snazzy companies worldwide, throwing around

Intern's Perspective– Ethan Sit (Continued)

By: Ethan Sit (Aerospace Engineering student– MIT)

computer science buzzwords like 'machine learning,' 'Bitcoin,' 'the cloud,' or some ridiculous amalgamation of them. So when I came across this internship offering, frantically typing cover letters whilst traveling down south for a 'business trip' (read 'spring break'), the thought of it flew to the back of my head.

Yet, unbeknownst to me, MassDOT offered everything a young aerospace engineering major wanted. Luring me in with soft whispers of 'drones,' 'drones,' and 'even more drones,' I was ecstatic to join my home state's DOT in helping develop their Drone Pilot Program. MassDOT Aeronautics has been great helping me learn the ropes of professional 9 to 5 life, especially since work on campus entails long nights in the lab with nobody to comfort you but your fast asleep supervisor, empty bottles of Soylent, and 3D printed effigies of your friends. After a crash course in the programs goals, I quickly was assigned to work on exciting computer vision projects in image georeferencing and license plate recognition. In other words, I get to tell my trusty laptop to number crunch and draw lines on images taken by MassDOT drones. (Sorry, my boss has told me before that I shouldn't get lost talking about code all day. I'm trying my best, Scott.)

What have I done so far? I've honed my skills in Python, my new best friend. I've met with industry leaders in unmanned aviation over some very good food. And while some days I spend slogging away in a cubicle, most days I am celebrating another bug fixed, or flying drones in colorful locales ranging from rural Massachusetts to Fenway Park. And as the Piper Arrow I was in touched the runway, I had a dataset that could test my code to its limits. It's the first time I can say I truly coded something by myself. For my first taste of professional aerospace R & D, I'd say MassDOT was exquisite. ✈

Published by

Massachusetts Department of Transportation
Aeronautics Division

Logan Office Center
One Harborside Drive
Suite 205N
East Boston, MA 02128
617-412-3680
www.mass.gov/massdot/aeronautics
Send suggestions for stories or comments to:
Sara.Laghlam@state.ma.us
or
617-412-3680

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